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## The effect of counterfactual priming on women's decisions regarding mammography screening

### Abstract

The counterfactual priming effect occurs when "what if" and "if only" thoughts about one event broadens ones mind-set to consider a more diverse range of evidence and possibilities in a different decision making or problem solving context. This study examined this effect as applied to mammography screening decisions.

### Keywords

effect, counterfactual, priming, women, decisions, regarding, mammography, screening

### Disciplines

Arts and Humanities | Life Sciences | Medicine and Health Sciences | Social and Behavioral Sciences

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# The Effect of Counterfactual Priming on Women's Decisions Regarding Mammography Screening

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## Abstract

The counterfactual priming effect occurs when “what if” and “if only” thoughts about one event broadens one's mind-set to consider a more diverse range of evidence and possibilities in a different decision making or problem solving context. This study examined this effect as applied to mammography screening decisions. We hypothesized that: (i) counterfactual priming would encourage women to seek out information of crucial relevance to the decision to start mammography screening at an earlier age (e.g., family history) rather than information that focuses on peripheral considerations (e.g., discomfort); and (ii) regardless of the actual decision about commencing screening, counterfactually-primed individuals would feel more justified about their decision, and would report less regret should they subsequently receive an early-stage breast cancer diagnosis. We tested these hypotheses with female undergraduates ( $N=82$ ) using a role-playing decision-making task. Participants in the experimental group read an unrelated story designed to prime a counterfactual mind-set at the outset of their participation; but participants in a control group did not. The data supported both hypotheses. Our discussion focuses on a proposed theoretical model that postulates the conceptual links between counterfactual priming, information-seeking behaviour in the decision-making process, decision justification, and regret.

## Introduction

Early detection and treatment of breast cancer can significantly reduce mortality rates (National Cancer Institute, 2006). Thus far regular mammography screening is the most effective method for detecting breast cancer at an early stage when it is most treatable (Wu & Yu, 2003). Therefore, it is of practical value to identify factors that influence women's decision-making process when making decisions about mammography screening, and accordingly adopt better strategies to help women who are currently reluctant to undertake mammography screening make more justified and less regrettable decisions. This paper focuses on how counterfactual thinking – the process of

imagining how a factual event could have turned out differently by mentally undoing mutable aspects of the event (Roe, 1997) – may potentially influence women's deliberation and decision making regarding commencing regular mammography screening.

## Counterfactual Priming (CFP) Effect

Previous research on counterfactual thinking in relation to health behaviour is scarce and has mainly focused on the effect of counterfactually-based emotional reactions (e.g. anticipated regret) or judgments of causality on health behaviour (e.g., Page & Colby, 2003; Richard, van de Pligt, & de Vries, 1996). More recent research has begun to recognize the potential role of counterfactual thinking in improving women's intention to undergo regular mammography screening (Chan, Jones, & Rich, 2007). We propose that a different approach that capitalizes on the CFP effect – the finding that mindsets, or cognitive orientations can serve as primes and influence future judgment and behaviour in an unrelated context (e.g., Gollwitzer, Heckhausen, & Steller, 1990) - may also enrich our knowledge of factors influencing health behaviour and its evaluation.

The effect of mindset priming on judgment and behaviour has been documented in the literature on simulation heuristic, which refers to the mental operations that bring things to mind through the construction of examples or scenarios (Kahneman & Tversky, 1982). The activation of simulation heuristic, which can be deemed as a particular kind of mindset priming, increases the propensity to simulate, attend to, and consider alternative possibilities.

Galinsky and Moskowitz (2000) demonstrated that CFP leads individuals to adopt a broader mindset that brings alternative, albeit converse information to mind, which later affect judgments and behaviour in unrelated tasks. Participants in the CFP group in Galinsky and Moskowitz (2000, Expt 3) read a scenario depicting a woman who either won or lost an attractive prize as a result of moving to another seat at a concert. Subsequently, all participants did a trait-hypothesis-testing task which assessed their readiness to seek

hypothesis-disconfirming evidence. Participants' task was to test the hypothesis that a fictitious interviewee was an extrovert by choosing questions to ask the interviewee. The question list included items designed to elicit hypothesis-confirming answers, hypothesis-disconfirming answers, or answers that neither confirmed nor disconfirmed the hypothesis. It was found that participants primed with an unrelated counterfactual scenario chose significantly more questions eliciting hypothesis-disconfirming answers than did those exposed to a non-counterfactual scenario. Their findings suggest that exposure to a counterfactual event in a previous task increases the accessibility of the alternative, albeit converse, information in a subsequently unrelated task.

### Decision Justification Theory (DJT)

A common emotional consequence following poor decisions is the experience of regret. Connolly and Zeelenberg (2002) proposed the DJT to explain the psychological mechanisms of decision-related regret. The DJT's core idea is that, faced with a poor outcome to an event, people tend to ask themselves whether the decision and the process that led to it were justified. If they were partially or entirely unjustified, people would feel regret, and the intensity of regret is increased by the seriousness of the outcome. The DJT postulates two sources of decision-related regret - regret resulting from the evaluation of the factual outcome compared to the imagined outcome via counterfactual thinking (bad decisions), and regret resulting from the insufficiently justified decision-making process (deciding badly).

The empirical evidence supporting DJT came from a study by Pieters and Zeelenberg (2005). They studied people's experience of regret in national elections and found that the quality of the decision process influences the experience of regret, independent of the valence of the decision outcomes. Furthermore, strong justification for decision process decreased regret independent of the decision outcome. They concluded that decision process and decision outcome can be two independent sources of regret.

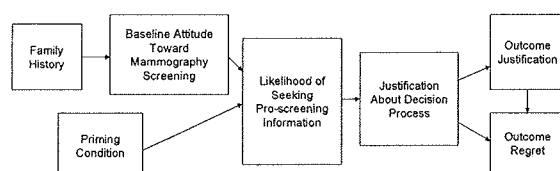


Figure 1: Proposed conceptual links among counterfactual priming, information seeking, decision justification, and regret.

### Conceptual Links between CFP and DJT

Integrating the key assumptions and findings with regards to CFP and the DJT, the major thesis of this paper is that counterfactually-primed individuals will be more prone to seek a wider range of information including that which favours the opposing alternative before they make decisions, and consequently feel their decisions more justified and less regrettable than non-primed individuals when the decision outcome turns out to be bad. We report a study that assessed this proposal in the context of women's information-seeking behaviour when making decisions about commencing mammography screening.

Figure 1 shows a theoretical model that outlines our proposed conceptual links among CFP, information-seeking behaviour, DJT, outcome evaluation, and the experience of regret when a bad outcome ensues (e.g., being diagnosed with breast cancer). This model also incorporates two additional variables, namely, family history of breast cancer (FH) and baseline attitude toward mammography screening (BAtt). As shown in Figure 1, decision justification is examined in terms of justification before the decision outcome is known, which is taken to reflect one's perceived level of justification about the decision-making process (Justif1). In contrast, perceived decision justification on finding out a poor outcome (Justif2) is expected to reflect a combination of one's evaluation about the decision itself and its resulting outcome. This model suggests that CFP influences information-seeking behaviour assessed by the likelihood of seeking information to address pro-screening questions (ProScreen). We operationalised ProScreen as an indicator of the extent that individuals seek information to refute the focal hypothesis (*"my reluctance to commence mammography screening is the correct decision"* in this case). ProScreen in turn influences Justif1, Justif1 influences both Justif2 and regret, and Justif2 influences regret. Furthermore, FH has an effect on BAtt, and BAtt exerts an effect on ProScreen.

## Method

### Participants

Our sample included 82 female undergraduates from different faculties of the University of Wollongong (mean age = 21.54 years, range = 17-43 years). Participants were volunteers who responded to a recruitment flyer posted both within an on-line research participation system and on noticeboards across campus for a study on women's health issues. Participants were evenly distributed between a priming condition and a neutral condition (see *Procedure*). Five additional participants were initially tested but excluded from the final sample for either having previously had mammography screening (2 participants) or failing to

generate counterfactuals when placed in the priming condition (3 participants). Recruitment and all ensuing research activities were conducted in accordance with protocol approved by the University of Wollongong Human Research Ethics Committee.

## Materials

**Counterfactual Priming Scenario.** An upward counterfactual scenario was adapted from Galinsky and Moskowitz (2000) which depicted a woman (Sue) at a rock concert who switched from her original seat to a vacant seat. Afterwards, it was announced that a fan would win an interstate trip; the winner was to be determined by the seat number currently occupied. Sue's old seat from which she had just switched was chosen; so Sue did not win the trip. A separate pilot study demonstrated that this scenario readily prompts spontaneous upward counterfactual thoughts.

**Decision-Making Scenario.** To examine the CFP effect on information-seeking behaviour, we designed a decision-making task regarding mammography screening based on the trait-hypothesis-testing paradigm (Galinsky & Moskowitz, 2000). This scenario included two parts. The first part depicted a 40-year-old woman (Jane) who was considering commencing mammography screening but was currently reluctant to undertake it. The second part presented a bad outcome: Jane was diagnosed with Stage 1 breast cancer one year later, regardless of her decision to commence undergoing mammography screening or not.

**Mammography Screening Question Scale (MSQS).** We constructed an MSQS which mimicked the question list used in the trait-hypothesis-testing paradigm (Galinsky & Moskowitz, 2000). The MSQS consisted of 20 items, with 10 pro-screening items prompting women to seek information that encouraged them to evaluate the importance of mammography screening (e.g., prevalence of breast cancer and risk factors), and 10 anti-screening items prompting women to seek information that discouraged them from having mammography screening (e.g., inconvenience and discomfort associated with mammography screening). These are common disturbances yet not sufficiently justified medical reasons that often stop women from undergoing mammography screening. The 20 items in the MSQS were chosen after a separate preliminary pilot study from 30 initial candidate items. The final MSQS showed satisfactory reliability (Cronbach's  $\alpha = .89$ ). There were four versions of the MSQS<sup>1</sup>. The MSQS requires the respondent to choose 10 most

important questions (out of 20) for which they would like to seek further information. ProScreen was measured using the total number of pro-screening items that participants chose from the MSQS.

## Scales for Assessing BAtt, Justification and Regret.

A series of 6-point rating scales were used to assess BAtt, Justif1, Justif2, and regret. BAtt was assessed via the question, "*what is your attitude toward breast cancer screening?*" (1 = "*extremely negative*"; 6 = "*extremely positive*"). Justif1 [and Justif2] was assessed via the question, "*to what extent do you think your decision regarding mammographic screening is [was] justified?*" (1 = "*slightly justified*"; 6 = "*completely justified*"). Finally, regret was assessed via the question, "*to what extent do you think your decision a year ago was regrettable?*" (1 = "*not regrettable at all*"; 6 = "*extremely regrettable*"). BAtt was concerned with the participant's own attitude, whereas the justification and regret measures required participants to respond from the scenario character's perspective (see Procedure).

## Procedure

Participants were tested in small groups of up to four participants per session. Sessions were randomly assigned to either the priming or neutral (i.e. control) condition. Those in the priming condition initially received the CFP scenario, and were advised that it was the pilot testing material for another unrelated study. They read the scenario and wrote down thoughts that came to mind assuming they were the main story character. Participants in the neutral condition did nothing at this stage. Afterwards, all participants answered demographic questions about their age, FH, whether or not they had mammography screening previously, and their BAtt.

Subsequently, participants read the decision-making scenario and were instructed to do all the remaining tasks from the perspective of the scenario character (Jane). Participants received and completed one version of the MSQS. Then they made the screening decision by choosing from two options: (1) will attend mammographic screening within the next 12 months, and (2) currently have no intention/plan to have mammographic screening. Afterwards, participants completed the first justification scale, read the second part of the decision-making scenario, and completed the second justification scale and the regret scale. At the conclusion of the study, participants were debriefed.

## Results

An experimenter and a second rater who was unaware of the hypotheses independently coded participants' counterfactual thoughts as "*present*" or "*absent*". The agreement rate was 93%. Discrepancies were resolved through discussion. Responses on FH were given a

<sup>1</sup> The four versions of the MSQS had different randomized ordering of the 20 items. This was done to minimize any order effects on participants' information-seeking behaviour.

score of 0 if participants indicated no family history, 1 if an extended family member (e.g. aunt) had breast cancer, and 2 if an immediate family member (e.g. mother) had breast cancer. None of the participants reported having an immediate family member who had breast cancer; in both experimental conditions, 22.5% of participants reported having an extended family member who had breast cancer.

Table 1 shows the descriptive statistics on all key variables in this study. Preliminary analyses showed that there was no significant difference between the priming and neutral groups in BAtt, Justif1, Justif2, and Regret. In addition, a t-test conducted on ProScreen revealed no significant difference between individuals who decided to undertake screening ( $M = 5.72$ ,  $SD = 1.30$ ) and those who did not ( $M = 5.55$ ,  $SD = 1.41$ ),  $t(80) = -.52$ ,  $p > .05$ , which indicated that ProScreen was unrelated to the subsequent decision, which justifies examining the direct path from ProScreen to Justif1, Justif2, and Regret.

Table 1: Mean BAtt, Proscreen, Justification and Regret Scores by Experimental Condition

Measure	Condition	
	Priming	Neutral
BAtt	4.93 (1.17)	5.05 (1.07)
Proscreen	6.46 (0.90)	4.88 (1.21)
Justif1	4.51 (1.29)	4.34 (1.53)
Justif2	4.00 (1.84)	4.54 (1.65)
Regret	4.51 (1.29)	4.34 (1.53)

Note. Standard deviations are shown in parentheses

We conducted a Partial Least Squares (PLS) analysis to test the proposed model presented in Figure 1. Statistical tests for significance were conducted using bootstrapping to determine parameter estimates (Barclay, Higgins, & Thompson, 1995). The PLS analysis program PLS-Graph (Chin & Newstead, 1999) was used to conduct the analysis.

As shown in the summary of results in Table 2, most of the links between variables in the model were significant. In support of the model, FH was a significant predictor of BAtt. However, we did not find a significant link between BAtt and ProScreen ( $b = -.07$ ,  $p = .42$ ). Instead, Proscreen was significantly predicted by experimental condition, with participants in the priming condition choosing more prescreening items than those in the neutral condition (see means in Table 1). In turn, high Proscreen scores were predictive of a higher level of Justif1 ( $p = .07$ ), with participants who chose a higher number of prescreening items reporting feeling more justified about the decision-making process. High scores on Justif1 predicted greater decision justification on hearing the poor outcome (Justif2), which itself was a strong predictor of regret

about the decision process and outcome. Taken together, these findings support the theoretical model. As predictors, family history accounts for 7.4% of the variance in BAtt. BAtt and CFP account for 36.7% of the variance in ProScreen. ProScreen accounts for 4.8% of the variance in Justif1. Justif1 accounts for 31.7% of the variance in Justif2. Justif1 and Justif2 jointly account for 50.9% of the variance in regret.

Table 2: Partial Least Squares (PLS) Analysis of the Proposed Model

Path	Original sample estimate <sup>a</sup>	Mean <sup>b</sup>	SE <sup>b</sup>	t-statistic <sup>b</sup>
FH → BAtt	.27	.27	.10	2.81*
BAtt → ProScreen	-.07	-.09	.09	.82
CFP → ProScreen	.60	.60	.07	8.93**
ProScreen → Justif1	.22	.20	.12	1.84
Justif1 → Justif2	.56	.56	.08	7.43**
Justif1 → Regret	-.19	-.22	.11	1.80
Justif2 → Regret	-.59	-.60	.08	6.97**

<sup>a</sup> Degrees of freedom = 81, <sup>b</sup> degrees of freedom = 99.

\*  $p < .01$ ; \*\*  $p < .001$

## Discussion

As predicted, counterfactually-primed participants chose more pro-screening items than neutral participants. Although our preliminary analyses showed that CFP had no direct relationship with justification and regret, results from model testing indicated that CFP affected decision justification and regret via information-seeking behaviour. We found that CFP had a strong effect on information-seeking behaviour, which had a flow-on effect on subsequent decision justification and regret. Therefore, the best predictor of information-seeking behaviour in the model, namely, CFP, had an indirect effect on decision justification and regret. We also found that Justif1 exerted a direct, albeit small, effect on regret ( $b = -.19$ ,  $p = .08$ ), which was consistent with the DJT's prediction that the decision process can be an independent source of the overall experience of decision-related regret. Taken together, these findings are consistent with the proposed theoretical model showing that there are conceptual links between CFP, information-seeking behaviour in decision-making and regret.

Our paper provides further evidence for the CFP effect and its generalisability to a health decision-making context. However, its key novel contribution is

that it demonstrates how the CFP effect may be related to predictions of the DJT. The effect of information-seeking behaviour on decision justification indicated that seeking information to address pro-screening questions as a result of CFP led women to judge their decisions as more justified. This is in line with previous research suggesting that intensively searching for information to evaluate the alternatives is an essential indicator of a high-quality decision-making process (Janis & Mann, 1977), and decisions made based on high-quality decision-making processes are often judged as justified (Connolly & Reb, 2005; Pieters & Zeelenberg, 2005). In our study, primed participants sought significantly more information that might disconfirm the focal hypothesis. This information helped them to evaluate the competing alternative in a more balanced fashion, thereby improving the quality of the decision processes. Thus they were more likely than neutral participants to perceive their decisions as justified. Finally, faced with a bad outcome, primed participants reported less regret than neutral participants presumably because primed participants perceived their decisions as more justified, and according to the DJT, strong decision justification attenuates the experience of regret when the outcome turned out to be poor (Connolly & Zeelenberg, 2002).

One limitation of the present study was that we assessed decision justification and regret using a bad outcome only. This was because our primary interest in DJT was examining DJT in relation to CFP rather than a direct test of DJT per se. Nevertheless, further study should consider manipulating the valence of the decision outcome to examine whether decision outcome influences regret independent of the decision-making process, and to what degree the decision process or decision outcome alone has an effect on regret. Furthermore, in evaluating the present findings, it should be noted that factors other than counterfactual thinking, such as baseline knowledge about mammography and breast cancer, and individual reasoning style, may also influence information-seeking behaviour in the decision process. Therefore, it will be worthwhile to also assess these factors in future studies.

The present study has provided initial empirical evidence for the relationship among CFP, information-seeking behaviour during the decision-making process, reports of justification and regret as stipulated in the DJT. The demonstration of the conceptual links between CFP, information-seeking behaviour in decision-making, decision justification, and regret provides theoretical ground for further investigating the use of CFP to help women who are currently reluctant to undergo mammography screening, so that they can make more informed, more justified, and less regrettable mammography decisions.

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